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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/584,739	06/01/2000	Kuniko Kikuta	PF-2622/NEC/US/mh	3028

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EXAMINER

QUACH, TUAN N

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 07/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Applicati n No.</b>	<b>Applicant(s)</b>	
	09/584,739	KIKUTA, KUNIKO	
	<b>Examin r</b>	<b>Art Unit</b>	
	Tuan Quach	2814	

-- The MAILING DATE of this communicati n app ars on the cover she t with the correspond nc address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 April 2002 .
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-37 and 57-63 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-37 and 57-63 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
     If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |  |
|--|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>8</u> . | 6) <input type="checkbox"/> Other:   |

### DETAILED ACTION

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-37 and 57-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al., Edelstein et al., and Dubin.

Tsuji et al. teach the inclusion of various elements including P, Ni, Ag, B, As, Si, Cr, and appropriate amounts, e.g., see the abstract, column 4 lines 29-69, Table 1 and 2, column 6 lines 65-66, column 7 lines 66-68 to obtain alloys having excellent conductivity and heat resistance. The selection of appropriate amounts is also shown, e.g., column 4 lines 37-58. Tsuji et al. however do not recite all the additives claimed.

Edelstein et al. also teach copper alloys, e.g., column 6 lines 10 to column 8 line 50 wherein copper alloys including various materials, e.g., B, P, Ni, Ag, and various

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metal, such as Mo, W, Si, Ge, Ta, to obtain improve electromigration resistance.

Application of such materials on the via hole in semiconductor device is also shown.

Dubin teaches the use of copper alloys including in via contact holes, e.g., trench 12, (including barrier 52, e.g., column 7 lines 7-21), including Cu alloy layers 56, 57, the alloys being suitable Cu alloys including alloys of Cu with any of various metal, such as Ag, Ni, etc., and wherein the alloys can also include various alloying elements such as Ni, Ag ... See column 5 line 30 to column 6 line 50.

It would have been obvious to one skilled in the art in practicing the Tsuji et al. invention to have included appropriate or suitable and conventional elements in the copper alloys since such inclusion is conventional as delineated in Edelstein, or Dubin wherein such alloys would have excellent conductivity and electromigration resistance. The selection of appropriate amounts and appropriate and conventional additives would have been met and further would have been within the purview of one skilled in the art given the teachings of Tsuji et al., and Edelstein et al. as delineated above. The inclusion of the copper alloys in contact to semiconductor devices including barrier thereon is well known as delineated in Edelstein or Dubin. Conversely, it would have been obvious to one skilled in the art to have employed in Edelstein or Dubin the copper alloys including appropriate amounts of the suitable additions to obtain the desired characteristics for such as electrical conductivity and heat resistance as delineated in Tsuji et al. Any additives not explicitly recited otherwise would have been obvious and would have been within the purview of one skilled in the art given the additives delineated. The provision of the melting point and of the mass transfer in claims 1 and

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12 such would have been obvious or inherent since they correspond to the same copper alloy having the composition in question and does not require any further structure, thus the characteristics would follow, absent evidence to the contrary, and given that the copper alloy would contain the claimed element. The provision of the copper alloy in trench groove is well known in the art and the employment of a predetermined narrow width for the opening would have been conventional and would have been within the purview of one skilled in the art.

Applicant's arguments filed April 8, 2002 have been fully considered but they are not persuasive.

Initially see the new grounds of rejections delineated above. Furthermore, contrary to applicant's argument, Tsuji et al. clearly show that the appropriate and overlapping range of the element can be employed wherein the strength and the heat resistance is improved. Additionally, the employment of the copper alloys for the purpose of increasing electromigration resistance on semiconductor substrate is well known as shown in Edelstein. See also Dubin the abstract and portions delineated above wherein such application including within trenches on semiconductor substrate is shown and wherein the use of copper alloys with various alloying elements are taught, e.g., column 5 line 60 to column 6 line 67. It remains that such application would not require any inventiveness and would have been obvious to one skilled in the art given the combined teachings of the references. of interconnection structure is well known and advantageous as delineated in the abstract, column 6 lines 33.

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Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number is 703-308-1096. The examiner can normally be reached on M - F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

  
Tuan Quach  
Primary Examiner